SYNOPSIS

CHAPTER 1

INTRODUCTION

The muscle atrophy is one of the least concerned and most frequent problems in Intensive care units. Atrophy describes both structural and functional disorder occur to the muscles. Loss of skeletal muscle protein results from an imbalance between the rates of muscle protein synthesis and degradation. The clinical consequences of bed rest may mimic those of cachexia, including rapid loss of muscle, insulin resistance, and weakness. Prophylaxix against Atrophy includes nutrition support, exercise and use of an anabolic agents, it may slow or prevent muscle loss. Long term complications of critical illness include intensive care unit acquired weakness and neuropsychiatric diseases. Immobilization secondary to sedation might potentiate these problems.

Muscle wasting and weakness are common and physical recovery is slow. Critical illness and hospitalization may results in catabolic stress, anorexia and immobilization which cause worsening of the nutritional status of persons. Disuse of muscles because of bed rest or chair rest leads to a loss of muscle mass of $\leq$1.5%/d in adults. Healthy well-nourished individuals show signs of skeletal muscle atrophy if immobilized for more than 72 hours[1]

Many older individuals decline functionally during hospitalization. A study reports on the deteriorating consequences of bed rest may be one effect of 10 days of bed rest on multiple functional parameters in healthy older adults[2]

NEED OF THE STUDY

As technology and medications have improved and survival rates are also increasing in Intensive care Units, so it is now important to focus in improving the patient outcome and recovery. To do this, ICU patients need to be assessed and started on an early mobility program, if stable. The literatures have demonstrated that patient can safely and feasibly mobilize even while requiring mechanical ventilation.

The patients in mechanical ventilation are high risk for muscle deconditioning due to limited mobility from numerous monitoring equipment and multiple conditions. Also the patients with non-Mechanical support is prone to get muscle deterioration due to immobility or inadequate mobility in ICU.

Frequently, a critically ill patient only receives movement from nurses; such as, being turned side to side, pulled up in bed, or transferred from bed to stretcher for a test or may get physiotherapy support once in a day. The implementation of early mobility and exercise protocol that can be used by critical care nurses is important for positive patient outcomes minimizing the functional decline due to an ICU stay.

The investigator observed that even though the patient is not admitted to ICU under brain pathology or neuromuscular diseases, their muscular atrophy is a common complication due to the immobility. The rate of admission to critical care area are common and on an average 164 patients are with critical illness in a month and for 5-6 days of continuous ICU stay and some of them are prolonged more than that. The investigator observed that the ICU patients are not mobilized properly on time or getting inadequate or irregular physiotherapy. Due to that the weaning from the ventilation, duration of ICU and hospital stay are prolonging also observed the general appearance of the patient after ICU stay are changing. It is leading to financial burden to the patient as well as to the family. So the investigator planned to formulate a nursing intervention package to improve the patient condition, reduce the ICU stay as well as to reduce cost of the hospital stay.

CHAPTER 2- AIMS AND OBJECTIVES

The aim of the present study was to find out the effect of Nursing Intervention package on muscle atrophy of critically ill patients

2.1 STATEMENT OF THE PROBLEM

A study to assess the effect of Nursing Intervention Package on limb circumference and muscle power in preventing muscle atrophy among critically ill patients in a selected hospital at Pathanamthitta District.

2.2 Specific Objectives

1. To study the prevalence of muscle atrophy of critically ill Patients.
2. To assess the demographical, clinical and treatment characteristics of critically ill patient.
3. To measure muscle strength and Limb circumference of critically ill patient.
4. To assess the effectiveness of Nursing Intervention Package on muscle strength and Limb circumference of critically ill patient.

5. To correlate the effect of nursing intervention package on selected outcome variables.
6. To associate the muscle strength and Limb circumference of critically ill patients with selected baseline Variables.

2.3 OPERATIONAL DEFINITIONS:

An operational definition is a clearly defined set of procedures for obtaining a measure of the construct of interest. The operational definitions of the present study were as follows.

- **Muscle atrophy**- In this study Muscle Atrophy means depletion of Muscle mass and Muscle Strength of a critically ill patient and measured by using an inch tape and measuring the circumferences of Mid-arm, Mid-thigh, Mid-calf and assessment of the muscle power by using standard Muscle Strength grading system.
- **Limb circumference**- includes measurement in the muscle areas of Upper extremities and Lower extremities of the patient such as Mid-arm Circumference, Mid-thigh Circumference, Mid-calf Circumference
  - ✓ **Mid-arm Circumference**- include identifying and measuring from the greater tubercle to the lateral epicondyle of the humorous and then dividing that longitudinal measurement into two equal halves and then taking the circumference of the underlying muscle.
  - ✓ **Mid-thigh Circumference**- include identifying and measuring from the greater Trochanter to the Lateral Condyle of Femur and then dividing that longitudinal measurement into two equal halves and then taking the circumference of the underlying muscle
  - ✓ **Mid-calf Circumference**- include identifying and measuring from the medial Condyle to the Medial Malleolus of the Tibia and then dividing that longitudinal measurement into two equal halves and then taking the circumference of the underlying muscle.
- **Muscle Power Assessment**-the investigator with the help of the standard criteria assessed the muscle power of the upper and lower extremities and recorded in the observation checklist.

1. **Nursing Intervention Package**- in this study nursing intervention Package includes- Positioning, selected Range of Motion Exercises of Upper and Lower extremities, Stretching exercises include PNF- Proprioceptive Neuromuscular Facilitator and Massage therapy, which are given to the patient by the investigator and by the physiotherapist twice in AM and

PM duty shift**.** The investigator attended a special training program from the physiotherapy department before giving the intervention.

- ✓ **POSITIONING**

The investigator makes sure that the patient is getting every 2nd hourly position change by the nurses and instructed them to give the positions of the following

- **Supine position** - The supine position means lying horizontally with the face and torso facing up.
- **Left lateral position** - Sims **position** the patient lies on the **left** side with the **left** thigh slightly flexed and the right thigh acutely flexed on the abdomen; the **left** arm is behind the body with the body inclined forward, and the right arm is positioned according to the patient's comfort also Called **lateral position**.
- **Right lateral position**- it means the patient's **right** side is touching the bed, with right thigh slightly flexed and the left thigh acutely flexed on the abdomen, right arm is behind the head of the body and a pillow is often placed in between the legs for patient comfort.
- **Semi fowler's position** – in which patient positioned on their back with the head and trunk raised to between 15 and 45 degrees, although 30 degree is the most frequently used and the investigator directed the nurse to give 30 degree angle elevation.
- The investigator asked the nurses to record the position in the ICU chart as per they provide for their patients

- ✓ **RANGE OF MOTION EXERCISE.**

- **Range of Motion Exercises of Upper extremities** that includes

  Shoulder Joint- flexion, extension, Hyperextension, adduction, abduction, Internal and external rotation, horizontal abduction and adduction once in AM & PM duty shift.

  Elbow Joint- Flexion and extension, elongation of two- joint Biceps, Elongation of two-Joint Long head of the triceps Brachii Muscles, forearm pronation and supination once in AM & PM duty shift.

- **Range of Motion Exercises of Lower extremities** includes

  Knee Joint flexion and extension,

Hip- flexion and extension, adduction and abduction, internal and external rotation once in AM & PM duty shift.

Ankle- dorsiflexion, plantar flexion, inversion and aversion once in AM & PM duty shift

- ✓ **STRETCHING EXERCISE**

In this study stretching exercise are passive stretching, PNF (Proprioceptive Neuromuscular Facilitator) and self- stretching exercise.

a) Passive Stretching include static stretching ,Ballistic stretching and Mechanical stretching
   i. **Static stretching** is the slow and prolonged stretch to the extremities for 30 seconds and it was repeated for 5 times at a time once in AM & PM duty shift.
   ii. **Ballistic Stretching** means the investigator provided a jerky type of stretching by making to hit on a water filled balloone and it was given to 5 times for once in AM & PM duty shift.
   iii. **Mechanical stretching** means the investigator provided a tilting table and make the patient to sit by holding the table with the upper extremities for 20 minutes once in AM & PM duty shift and 1 kg traction was given to the lower extremities for 20 minutes once in AM & PM duty shift.

b) **PNF (Proprioceptive Neuromuscular Facilitator)** include Hold and Relax, Contract Relax and Slow reversal.
   - ❖ **Hold and Relax** means the investigator and physiotherapist do the passive ROM (Range of Motion) exercises for the patient and at the end of the ROM instruct the patient to contract the muscle while the hip flexing and extending the knee and shoulder flexing and extending the elbow and it was given to 5 times for once in AM & PM duty shift.
   - ❖ **Contract and Relax-** the investigator take the limb to the end range (eg. The knee is extended and hip is flexed with the patient in supine position) and the patient is asked to contract the opposite muscle to the muscle being stretched and it was given to 5 times for once in AM & PM duty shift
   - ❖ **Slow reversal** – the investigator takes the limb to the end range and the patient is asked to do isometric contraction of the hamstring muscle, by opposing the force given by the nurse and it was given to 5 times for once in AM & PM duty shift

c) Self- Stretching PNF means the patient himself does this stretching program. The investigator was given the instructions to the patient regarding the exercise as follows-

- Arm Exercise include
    i. Flexion- Abduction with lateral rotation of arm(left and right)
    ii. Extension- adduction with medial rotation of arm(left and right)
    iii. Flexion- adduction with lateral rotation of arm(left and right)
    iv. Extension- abduction with medial rotation of arm(left and right)

Above said each exercises, the patient was motivated to do 5 times for once in AM & PM duty shift

- Leg exercises include

    i. Flexion- Abduction with medial rotation of leg(left and right)
    ii. Extension- adduction with medial rotationof leg(left and right)
    iii. Flexion- adduction with lateral rotation of leg(left and right)
    iv. Extension- abduction with medial rotation of leg(left and right)

    Above said each exercises, patient was motivated to do 5 times for once in AM & PM duty shift

- ✓ **MASSAGE THERAPY**

The investigator included Swedish Massage techniques in the study that include- Effleurage, Petrisage, friction, vibration, percussion, passive and active movements. The sequence and times of each techniques are as follows

- Effleurage: Gliding strokes with the palms, thumbs and/or fingertips
- Petrissage: Kneading movements with the hands, thumbs and/or fingers
- Friction: Circular pressures with the palms of hands, thumbs and/or fingers
- Vibration: Oscillatory movements that shake or vibrate the body
- Percussion: Brisk hacking or tapping
- Passive and active movements: Bending and stretching

Above said each techniques the investigator was done for the patient for 5 times in PM duty shift

2.4 HYPOTHESES:

1. There is a significant difference in the pre and post assessment of limb circumference and muscle power of experimental group.
2. There is a significant difference in post assessment of limb circumference and muscle power between experimental and control group**.**

3. There is significant correlation between muscle circumferences and muscle strength between experimental and control group**.**
4. There is significant association in the effect of nursing intervention package on limb circumference and muscle power of experimental group.
5. There is significant association in the effect of nursing intervention package on limb circumference and muscle power of control group.

2.5 ASSUMPTIONS

The study is based following assumptions

- Musculo-skeletal problems are common in Patients who are in Intensive care Unit.
- Strategy to prevent musculoskeletal problems will reduce the complications associated with musculoskeletal system.

2.6 DELIMITATION

- Limited to critical care area.
- Limited to adult patients.
- Limited to non-neuromuscular disease patients.

CHAPTER-3 REVIEW OF LITERATURE

3.1 Causes of skeletal muscle atrophy (10)

3.2 Interventions to prevent muscle atrophy in critical care area(9)

3.3 Non pharmacological measures to prevent skeletal muscle atrophy (8)

Griffiths RD, et al. conducted a study to assess the effect of Passive Stretching on the wasting of Muscle in the critically ill patients. Five critically ill patients who required a complete neuromuscular blockage for 7 days of ventilator support were studied. One leg of each patient was treated with Continuous Passive Motion (CPM) for 3- hour period daily while the other leg received only routine nursing care. Fiber atrophy was prevented in the more severely ill patients and there was a slight gain in fiber area (mean increase, +11%) in the CPM limb compared with the control leg, which decreased (mean decreased, -35%) over 7 days. Protein loss was significantly less in the CPM limb. Passive stretching can preserve the architecture of muscle fibres.

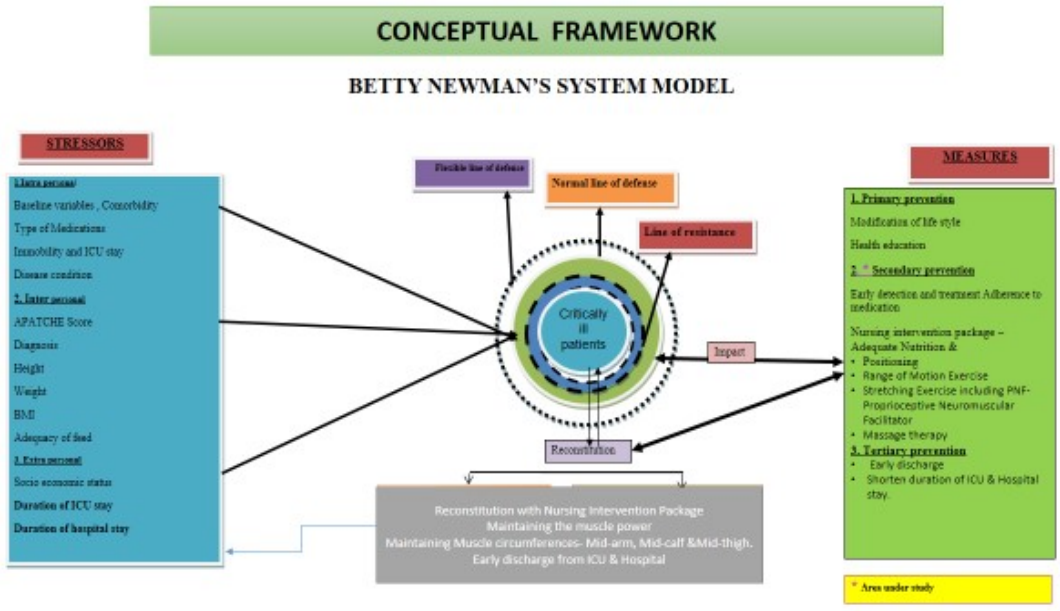
Young- Hai Hwang, et al.(2006) conducted a study on the *changes in Limb Circumferences and Muscle mass areas of critically ill patients using ventilators*. The data was collected from 30 critically ill patients using ventilators at Seoul hospital ICU. The limb circumferences and skin fold thickness were measured on the day of admission and on the 8th day of ICU. These measurements were taken on the right mid-arm, right- mid thigh and right mid-calf using a measuring tape and skin fold callipers. The findings were mid-arm, mid- thigh and mid-calf circumferences on the 8th day after admission to the ICU were significantly less than those on the day of admission to the ICU. Muscle areas of mid- arm, mid- thigh, and mid- calf on the 8th day after admission to the ICU were significantly less than those on the day of admission to the ICU.

Hans E. Berg. et al. (2006) conducted a study on ***hip, thigh and calf muscle atrophy and bone loss after 5- week bedrest inactivity.*** 10 healthy males were subjected to 5 weeks of experimental bed rest and 5 matched individual served as ambulatory controls. Maximum voluntary isometric hip and knee extension force were measured using the strain gauge technique. Cross sectional area of hip, thigh and calf muscles and radiological density of the proximal tibia bone were measured using CT. Bed rest decreased average muscle strength by 20% in the knee extension and by 22% in hip extension. Bed rest induced atrophy ($p>0.05$) of extensor muscles in the gluteal region, thigh and calf ranging from 2- 12%. Atrophy was more pronounced in the knee extensors [9%] and ankle plantar flexors (12%) than the gluteal extensor muscles (2%). Control subjects did not show any temporal changes in muscle when examined at similar time intervals. Finding of a substantial loss in hip extensor strength and significant atrophy of these muscles, demonstrate hip muscle deconditioning accompanies losses in thigh and calf muscles after bed rest.

Kortebein P, et al. conducted "effect of 10 days of bed rest on skeletal Muscles in healthy older adults" an Observational Study shows that early initiation of physical therapy in patients on Mechanical Ventilation is associated with more rapid return to ambulation, and improved functional independence. Even repeated passive mobilization has been shown to prevent muscle atrophy in mechanically ventilated patients. Adequate muscle mass appears to be the best predictor of good prognosis in critical illness. Rehabilitation studies have shown that exercise regimens and psychological intervention program have aided recovery and enhance coping behaviour in patients with widely differing diagnoses. 6 weeks rehabilitation program improves patient's physical and psychological recovery.

Schweickert WD, et al (2009) conducted a study on ***Early mobilization improves functional outcomes in critically ill patients.*** 104 mechanically ventilated patients who received <72 hrs of ventilation and immobilization were selected and randomized to receive either physical therapy or occupational therapy, during the period of daily interruption of sedation (Intervention; n=49) or daily interruption of sedation with therapy as ordered by the primary care team(control;n=55). The return to independent functional status at hospital discharge occurred in 29 (59%) patient in intervention group compaired with 19 (35%) patients in the control group (p= 0.02, odd ratio 2.7 (95% CI). Concluded that a strategy for whole- body rehabilitation consisting of interruption of sedation and physical and occupational therapy in the earliest days of critical illness was safe and well tolerated, and resulted in better functional outcome at hospital discharge and more ventilator free days compared with the standard care.

3.4 **CONCEPTUAL FRAME WORK**.



Conceptual frame work provides direction and impetus in the research, predicts phenomena and is an important source for the development of nursing interventions. The nursing model adopted in the present study is the Betty Neuman System Model. Betty Neuman, first developed this model in 1970 under the influence of various theories on open system, stressors and personal interactions and preventive interventions; and then published the revised edition of the conceptual model for nursing practice in 1980. The model aims to consider patient needs in

holistic terms. (Alligood MR . Tomey AM. Nursing Theorists and their work. 7th ed. Missouri: Mosby Publications; 2010.)

The application of this model in the present study is discussed under the following concepts.

Central core:- it represents the common survival factors maintaining the homoeostasis in the basic structure. In the present study, the core consists of the patients admitted in the critical care area.

Flexible line of defence: - it represents the protective mechanism that surrounds and protects the normal line of defence from invasion by stressors. In the present study, it may consists of proper intake of balanced diet, diet based on the disease condition, early mobility in ICU, proper exercise both active and passive exercises, prompt treatment as per the disease.

Normal line of defence: - it represents the state of wellness. In the present study it may consists of Age, Gender, BMI, Normal Bio chemical Parameters, adequate intake of food, healthy immune system, healthy physique and mind, a positive coping mechanism, less number of days in ICU, less number of days in Hospital. In the present study, the stressors had broken the state of wellness.

Lines of Resistance: - they are a series of concentric circles that surrounds the basic structure. They consist of protective factors, activated when stressors have penetrated the normal line of defence, causing a reaction symptomatically. In the present study, they may consist of defences activated by the patients, when they are affected by critical illness, compensatory mechanisms in each system and mental defence mechanisms.

Intra Personal stressors: - it includes the emotions, habits and physiological changes. In the present study, it may consists of risk factors like Acidosis, Metabolic or electrolyte abnormalities, sepsis, fever, Infection, Anaemia, Hypo and Hypertension, Bed rest, intake of Sedatives , Anti-cholinergic & Analgesics, Physical Restraints, and smoking.

Interpersonal Stressors: - it includes the strain of the person and family members. In the present study, it may include the role strain, and support system: family, hospital public relations service and resource availability for the immediate support system for the critical care patients.

Extra- Personal stressors: - it includes the job or financial pressure in nature that have the potential for disrupting system stability. In the present study, it may consist of financial instability, job insecurity, or study incompletion or delay.

Primary Level Prevention:- it strengthen the flexible line of defence and enables one to better deal with stressors and includes health promotion and maintenance of wellness. So to prevent one from becoming critical care patient, primary preventive measures to be practiced that include awareness to prevent systemic diseases, following adequate nutrition, and adequate treatments for the diseases.

Secondary Prevention:- it focuses on preventing damage to the central core by strengthening the internal lines of resistance and /or removing the stressors. In the present study, it may include safe and correct treatment for the disease, adequate food as per the RDA table and present disease condition. Administer Proper early mobility by multi disciplinary and ICU team, proper change of positioning, adequate oxygenation, adequate fluid and electrolyte balance using I/V infusions, deep vein prophylaxis treatment, early mobilization protocol, and proper ROM exercises.

In the present study investigator observed two groups to identify any improvement in the experimental group of patients with critical illness to identify the effect of nursing intervention package and length of ICU stay and Hospital stay.

Tertiary prevention:- it occurs after the system has been treated through secondary prevention strategies and offers support to the client and attempts to add energy to the system or reduce energy needed in order facilitate reconstitution. In case of managing critical care patients, these include preventing complications during hospitalization, physiotherapy, positive social and financial support system, counselling, visit by chaplain, education about proper nutrition and disease prevention, developing a disciplined life with positive stress relieving skills.

Positive and Negative outcome:- for the present study, positive outcomes include improving the general condition, improving or maintain all skeletal muscle power and muscle mass, decrease length of ICU and Hospital stay.

Negative outcomes for this present study may have skeletal muscle atrophy in upper and lower extremities, decrease muscle strength in the upper and lower extremities, prolonged ICU and Hospital stay.

CHAPTER 4 - RESEARCH METHODOLOGY

4.1 Research Approach-Quantitative approach

4.2 Research Design- True experimental design

Study Subjects	**Pre-test**	**Intervention**	**Post -test** (3^{rd} Day)	**Post- test** (5^{th} Day)	**Post- test** (7^{th} Day)
EG (Exp.Group)	O1	X	O2	**O3**	**O4**
CG(Control Group)	O1		O2	**O3**	**O4**

4.3 variables of the study:

- **Dependent Variable**- Muscle Atrophy of Critically ill patients
- **Independent Variable**- Nursing Intervention Package include Positioning, selected Range of Motion Exercises of Upper and Lower extremities, Stretching exercises include PNF- Proprioceptive Neuromuscular Facilitator and Massage therapy
- **Baseline Variables**- Age, Gender, current diagnosis, co-morbid conditions, Date of admission to ICU, Day of ICU stay, Length of Hospital stay, APACHE II Score, Admission to ICU from, Medications, height, weight, BMI, Risk factors of Muscle atrophy.
- **Outcome variable-** Number of days of ICU & Hospital stay.
- **Extraneous Variable-** Disease condition, Nutrition of the patient

4.4 Setting of the study: Selected hospital is an ISO certified, NABH & NABL accredited Medical College with 1200 beds. It is with well-equipped separate Critical Care Area and that include- MICU I & II, HDU. These areas are with total of 32 beds and average occupancy of 25 patients/ day.

4.5 Population of the Study- Patients who are admitted in the critical care areas other than Neuromuscular Disorders in selected Hospital at Pathanamthitta District.

4.6 Sample & Sample size: Critical patients who meet the inclusion criteria are considered. The size of the sample will be considered after the calculation of sample by Sloving's formula.[(n= $N/1 + Ne^2$) n= sample size, N= Total Population, e= margin of error(5%)] (80 + 80 in control and experimental group) and the investigator also saw the prevalence of Muscle atrophy in critical care area with 204 samples based on the sample calculation.

4.7 Sampling Technique

Sampling method of the present study was probability sampling. Simple random method was used to select the subjects from the target population.

Simple random sampling is the most basic probability sampling design. (polit 9^{th}edtn.)

In order to select the subjects, investigator entrusted the responsibility to the critical care shift in-charge by tossing the coin. All heads were considered as experimental group subjects and all tail were considered as control group subjects. The investigator trained six staff nurses to take measurement of the subjects and measurements were taken by the specially trained staff nurses and intervention was done by the investigator.

4.8 **Criteria for sample selection**

Inclusion Criteria

1. Patient who are in the first day of ICU admission.
2. Patients who are above 18 years of age.
3. Patient who admitted in the Medical Intensive care Units
4. Patients who are conscious, on or without mechanical ventilation
5. Patient who are willing to participate

Exclusion criteria-

1. Medical ICU patients who are diagnosed with Neuromuscular disorders
2. Patients Diagnosed with DVT
3. Patients diagnosed with pseudo hypertrophy of the muscles
4. Patients who need medical advice of immobilization in the extremities.

4.9 Development and Description of Tool

- The tools will prepare on the basis of the objectives of the study. The following steps will be adopted to develop the tool
- Review of literature
- Discussion with the subject experts – Guide & Co- Guides, physicians, Physiotherapist, Nursing personnel
- Interaction with the staff nurses and ICU ventilated patients
- Conduct of research studies with the subtopics of the main study
- Pre- testing of the prepared tool
- Obtaining the content validity and reliability of the tool.
- Pilot study - pilot study was conducted by $1/10^{th}$ of the sample size, and was decided after the sample size calculation using sloving's formula.
- This may provide the investigator to prepare a tool for the measurement of the variables

4.9.1 Description of the tool

Section- A-Baseline Variables- Age, Gender, Date of Admission to ICU, APACHE II Score, Primary Diagnosis, co- morbid diseases, Risk Factors of Muscle Atrophy, medications- muscle relaxant, Opioids, Sedatives, Height, Weight, BMI, Duration of ICU stay and Duration of hospital Stay

Section B: observation Check List includes Muscle strength Assessment tool- MMT tool for Upper and Lower extremities, Muscle circumference measurements tool include Mid- Arm, Mid Calf and Mid-thigh circumferences.

Section C- selected Biochemical Markers including Creatinine Kinase and electrolyte assessment, the investigator will obtain the data from the patient's case sheet.

Section D-Nursing Intervention Package includes- Positioning, Range of Motion Exercise of Upper and Lower extremities, stretching exercises including PNF and Message therapy.

- **Limb circumferences**- includes measurement in the muscle areas of Upper extremities and Lower extremities of the patient such as Mid-arm Circumference, Mid-thigh Circumference, Mid-calf Circumference
    - **Mid-arm Circumference**- include identifying and measuring from the greater tubercle to the lateral epicondyle of the humerous and then dividing that longitudinal measurement into two equal halves and then taking the circumference of the underlying muscle.
    - **Mid-thigh Circumference**- include identifying and measuring from the greater Trochanter to the Lateral Condyle of Femur and then dividing that longitudinal measurement into two equal halves and then taking the circumference of the underlying muscle
    - **Mid-calf Circumference**- include identifying and measuring from the medial Condyle to the Medial Malleolus of the Tibia and then dividing that longitudinal measurement into two equal halves and then taking the circumference of the underlying muscle.
- **Muscle Strength Assessment**-the investigator with the help of the checklist criteria assessed the muscle power of the upper and lower extremities and it was recorded in the observation checklist.

4.9.2 Development and description of the Nursing intervention package

The steps in planning for the Nursing Intervention Package

- Review of Literature
- Preparation of Blue print
- Preparation of first draft of Nursing Intervention Package
- Development of criteria checklist and content validity of Nursing Intervention Package
- Pretesting of Nursing Intervention Package
- Preparation of the final draft of the Nursing Intervention Package
- Pilot Study

4.9.3. Content Validity

Content validity refers to the degree to which an instrument measures what it is intended to measure (Nancy Burns). The tool along with the objectives, criteria checklist, baseline proforma, and hypothesis were submitted to 11 experts for validation. These experts were from the field of Nursing, Medicine, Physiotherapy, food & dietetics and statistics departments.

Baseline proforma was about 15 items with different options. As per the validators 15 items were agreed by changing and adding some of the options in the 15 items. Five validators were suggested to modify the options in the 5^{th} and 15^{th} items. Investigator modifies the options after seeing the relevancy of the options. Calculated content validity index comprising all the items in baseline proforma and tool was finalized.

All the items in the exercise procedure were agreed and suggestions regarding the frequency of exercise pattern were reduced as per the advice of the validators. The investigator also valuated the procedure protocol and it seems to be relevant. The tool also was reviewed by the statistician for its scoring. As per the experts decision modifications were made after discussion with the guide.

4.9.4. Reliability

Reliability of the research instrument refers to the degree of consistency or dependability with which an instrument measures an attribute

Inter -rater reliability of Manual Muscle strength test was done by Carolyn T Wardsworth et al in 1987 on 13 subjects receiving physical therapy at St. Luke's Hospital London.

The result obtained for the Manual Muscle Test was 0.98 and considered as a reliable test for Muscle Strength Testing.

The investigator had done inter-rater reliability for MMT on 3 critical care patients.

Reliability of the tool was established by Spearman Brown Prophecy Formula, $r^1 = 0.92$.

Thus it showed the highest reliability of the tools.

The investigator also had done the inter-rater reliability of Muscle circumference tool on 3 critical care patients. The reliability of the tool was established by Spearman Brown Prophecy Formula, $r^1 = 0.9$.

Thus it also showed the highest reliability in the tools.

Scale	Reliability	Method of reliability
Manual Muscle Strength tool	0.92	Inter rater reliability
Muscle circumference tool	0.9	Inter-rater reliability

4.10. Ethical Considerations

- Approval has been obtained from the institutional ethics committee.
- Formal approval was obtained from the hospital authority
- After getting the approval from the Meenakshi University (2015/ IEC/MAHER dated 20/11/15) the study was performed.
- Written informed consent was obtained from each of the study subject prior to data collection. The investigator explained the purpose of the study and assured the client that the data will be confidential.
- The study was conducted in the critical care areas of Pushpagiri Medical College Hospital, Tiruvalla, Pathanamthitta, Kerala.

4.11. Pilot Study

The pilot study was conducted from the period of 02/01/2018 to 23/02/2018 prior permission from hospital is obtained. Data collection procedure was implemented as it is for the main study. The pilot study was undertaken to find out the effectiveness of nursing intervention package on prevention of muscle atrophy among critical care patients in selected hospital at Pathanamthitta district.

The first objective was to assess the pre-test score of muscle strength and muscle circumferences of both experimental and control group. It was identified that pre-test muscle power and circumferences are equally distributed among experimental and control group.

The second objective was to determine the effectiveness of interventional package in prevention of muscle atrophy It was identified that the subjects of experimental group who received interventional package were continuing the same muscle circumference

and muscle strength of the pre assessment and control group had reduced circumference and muscle strength while comparing with the pre-assessment.

Third objective was to identify the correlation between muscle strength and muscle circumferences.

4.12. Data Collection Procedure

Permission from the head of the Institution and Ethical Committee obtained and informed consent from the caregiver as well as from the patient was obtained and assured the confidentiality. The researcher collected the data in the following phases.

Phase -l

Sampling method of the present study was probability sampling. Simple random method was used to select the subjects from the target population. In order to select the subjects and to reduce bias the investigator entrusted the responsibility to the critical care shift in-charge by tossing the coin. All heads were considered as experimental group subjects and all tail were considered as control group subjects. The investigator trained six staff nurses to take measurement of the subjects and measurements were taken by the specially trained staff nurses and intervention was done by the investigator.

The subject were identified by inclusion criteria to the experimental and to the control group. Pre-assessment was done to both control and experimental group

Phase II - Introduction of Nursing Intervention Package:-

- The investigator took training from the physiotherapy department and certified from a specialized physiotherapist.
- Later the Investigator took 5 patients and administer Nursing package to the subjects in front of the MICU physiotherapist and both confirmed how it will be proceed.
- After confirmed the exercises with the MICU physiotherapist, the physiotherapist provided exercises to the subjects in the morning and the investigator provided the exercises to the patient in the evening time.
- The subject received the exercise package ie, the exercise provider (researcher and Physiotherapist) did passive exercises and in the presence of the exercise provider the

subjects did active exercise. Each active and passive exercise will be done 5 times for twice daily.

Phase III

Exercises were continued for 07 days, and on 3rd and 7th day the investigator assessed for the post muscle circumference of mid- arm, mid-thigh and mid-calf, and assessed the Muscle power of upper and lower extremities. These assessments were done both for experimental and control group.

CHAPTER-5 ANALYSIS AND INTERPRETATION.

5.1 Organization of the data

Section I-Demographical, clinical and treatment characteristics of critically ill patient.

Section- II-To measure muscle strength and Limb circumference of critically ill patient.

Section – III- Effectiveness of Nursing Intervention Package on muscle strength and Limb circumference of critically ill patient.

Section-IV- Correlation of muscle power and related muscle circumferences.

Section-V- Association of muscle strength and Limb circumference of critically ill patients with selected baseline Variables

5.2 Homogeneity and comparison of groups based on background variables

5.2.1. Homogeneity and Comparison of groups based on Baseline Variables.

N=80+80=160

		Experimental		Control		χ^2	p
		Count	Percent	Count	Percent		
Age	20 - 40	4	5.0	9	11.3	3.55	0.315
	41 - 60	24	30.0	17	21.3		
	61 - 80	43	53.8	47	58.8		
	>80	09	11.3	7	8.8		
Gender	Male	49	61.3	49	61.3	0	1.000
	Female	31	38.8	31	38.8		
BMI	Normal weight	37	46.3	45	56.3	1.79	0.408
	Over weight	38	47.5	32	40.0		
	Obese	5	6.3	3	3.8		
Diet Adequacy	Inadequate Diet	11	13.8	0	0.0	11.81	p<0.01
	Adequate Diet	69	86.3	80	100.0		
Sepsis		13	16.3	23	28.8	3.58	0.058
DM		60	75.0	56	70.0	0.5	0.479
liver failure		12	15.0	9	11.3	0.49	0.482
pulmonary disease		29	36.3	32	40.0	0.24	0.625
CVS disease		47	58.8	43	53.8	0.41	0.524
Trauma		1	1.3	0	0.0	1.01	0.316
GI bleed		9	11.3	11	13.8	0.23	0.633
Renal Disease		31	38.8	33	41.3	0.1	0.747
Cancer		0	0.0	2	2.5	2.03	0.155
Other		10	12.5	6	7.5	1.11	0.292

All the demographic variables are statistically significant because p value is not significant so both experimental and control groups are homogenous.

5.2.2 Homogeneity and Comparison of background variables of Risk factors

N=80+80=160

Risk factors	Experimental		Control		χ^2	p
	Count	%	Count	%		
Acidosis	30	37.5	33	41.3	0.24	0.627
Metabolic / electrolyte abnormalities	27	33.8	35	43.8	1.69	0.194
Sepsis	9	11.3	15	18.8	1.76	0.184
Fever	10	12.5	25	31.3	8.23**	0.004
Infection	15	18.8	34	42.5	10.62**	0.001
Anaemia	27	33.8	33	41.3	0.96	0.327
Hypotension	12	15.0	15	18.8	0.4	0.527
Bed rest	78	97.5	74	92.5	2.11	0.147
Sedatives	16	20.0	18	22.5	0.15	0.699
Analgesics Medication	12	15.0	15	18.8	0.4	0.527
Physical restraints	50	62.5	68	85.0	10.46**	0.001
Anticholinergic medications	4	5.0	6	7.5	0.43	0.514
Hypertension	43	53.8	34	42.5	2.03	0.154
Smoking	36	45.0	28	35.0	1.67	0.197

**: - Significant at 0.01 levels

Table 5.2.2 depicts that all the demographic Variables are statistically significant because p value is not significant and hence the group is homogenous except fever, infection and physical restraints.

5.2.3 Homogeneity and comparison of the group based on Biochemical markers.

N=80+80=160

		Experimental		Control		χ^2	p
		Count	Percent	Count	Percent		
Creatinine	Normal	43	53.8	37	46.3	0.9	0.343
	Abnormal	37	46.3	43	53.8		
Haemoglobin	Normal	32	40.0	29	36.3	0.24	0.625
	Abnormal	48	60.0	51	63.8		
Sodium	Normal	38	47.5	42	52.5	0.4	0.527
	Abnormal	42	52.5	38	47.5		
Potassium	Normal	57	71.3	57	71.3	0	1.000
	Abnormal	23	28.8	23	28.8		
Calcium	Normal	44	55.0	44	55.0	0	1.000
	Abnormal	36	45.0	36	45.0		

Table 5.2.3. Shows that both experimental and control groups were found to be equal in relation to bio-chemical markers because p value is not significant so the groups are homogenous.

5.2.4 Effectiveness of Nursing Intervention Package on Muscle strength of critically ill patient

Muscle strength of the critically ill patients was divided into five categories as per the Muscle Strength scale score. Muscle strength of the samples was taken on Left and right limbs as well as upper and lower limbs.

5.2.4.(a) Comparison of upper Muscle strength between group on day 1, 3 & 7

N=80+ 80

	Day 1						Day 3						Day 7					
Muscle strength	Exp.gp		Control gp		Z#	P	Exp.gp		Control gp		Z#	P	Exp.gp		Control gp		Z#	P
	No	%	No	%									No	%	No	%		
Right Arm Trace	1	1.3	0	0.0	1.45	0.148							0	0.0	6	7.5	11.31	p<0.01
Poor	2	2.5	0	0.0			2	2.5	1	1.3	2.39*	0.017	0	0.0	26	32.5		
Fair	12	15.0	5	6.3			10	12.5	17	21.3			0	0.0	37	46.3		
Good	16	20.0	20	25.0			27	33.8	37	46.3			5	6.3	9	11.3		
Normal	49	61.3	55	68.8			41	51.3	25	31.3			75	93.8	2	2.5		
Mean ± SD	4.4 ± 0.9		4.6 ± 0.6				4.3 ± 0.8		4.1 ± 0.8				4.9 ± 0.2		2.7 ± 0.9			
Left Arm Trace	2	2.5	0	0.0	1.35	0.177							0	0.0	6	7.5	11.32	p<0.01
Poor	1	1.3	0	0.0			2	2.5	2	2.5	2.41*	0.016	0	0.0	26	32.5		

Fair	13	16.3	5	6.3			10	12.5	16	20.0			0	0.0	38	47.5		
Good	14	17.5	20	25.0			27	33.8	37	46.3			5	6.3	8	10.0		
Normal	50	62.5	55	68.8			41	51.3	25	31.3			75	93.8	2	2.5		
Mean ± SD	4.4 ± 1		4.6 ± 0.6				4.3 ± 0.8		4.1 ± 0.8				4.9± 0.2		2.7 ± 0.9			

Mann-Whitney U Test *: - Significant at 0.05 level

Table no. 5.2.4.(a) represents that both experimental and control groups are found to be homogenous before the intervention but while analysing it is evident that both left and right upper arm muscle strength of experimental group include trace and poor muscle strength in relation to its control group. Mean is significantly less in experimental group while comparing the control group. There is significant difference in the upper muscle strength of sample on 3rd day. The sample from the least powers like Trace and poor were improved in experimental group whereas after 3rd day muscle strength in control group was decreased to the category of poor.

While analysing the data critically, identified that experimental group maintained much higher muscle power than the control group. There is significant difference on 3rd day mainly favourable to experimental group due to nursing intervention.

There is significant difference in the upper muscle power of experimental and control group on day 7 and is favourable to experimental group. While analysing critically, Standard deviation is very less, no trace, poor and fair category and percentage of normal category become 93.8% both in left and right muscle strength. In control group normal and good muscle power categories are very less. There is statistically significant difference and that is favourable to experimental group due to the effect of nursing intervention package.

5.2.4.(b) Comparison of lower Muscle strength between group on day 1, 3 & 7

N=80+ 80

	Day 1						**Day 3**						**Day 7**					
Lower Muscle strength	Exp.gp		Control gp				Exp.gp		Control gp		Z#	P	Exp.gp		Control gp			
	No	%	No	%	Z#	P							No	%	No	%	Z#	P
Right leg Trace					3.59	p<0.01					3.59	p<0.01	0	0.0	8	10.0	10.68	p<0.01
Poor	2	2.5	3	3.8			2	2.5	3	3.8			2	2.5	29	36.3		
Fair	8	10.0	19	23.8			8	10.0	19	23.8			2	2.5	34	42.5		
Good	26	32.5	36	45.0			26	32.5	36	45.0			4	5.0	7	8.8		
Normal	45	56.3	17	21.3			44	55.0	22	27.5			72	90.0	2	2.5		
Mean ± SD	4.4 ± 0.9		4.6 ± 0.6				4.4 ± 0.8		4 ± 0.8				4.8 ± 0.6		2.6 ± 0.9			
Left leg Trace					4.09	p<0.01					4.09	p<0.01	0	0.0	8	10.0	10.76	p<0.01
Poor	2	2.5	2	2.5			2	2.5	2	2.5			2	2.5	26	32.5		
Fair	9	11.3	18	22.5			9	11.3	18	22.5			1	1.3	38	47.5		

Good	24	30.0	43	53.8			24	30.0	43	53.8			5	6.3	6	7.5
Normal	45	56.3	17	21.3			45	56.3	17	21.3			72	90.0	2	2.5
Mean ± SD	4.4 ± 0.9		4.6 ± 0.6				4.4 ± 0.8		3.9 ± 0.7				4.8 ± 0.6		2.6 ± 0.9	

Mann-Whitney U Test *: - Significant at 0.05 levels

Table 5.2.4.(b) represents that there was difference in both experimental and control group in the first day and it was favourable to control group. While comparing the experimental group between 1st and 3rd day the mean value is same in experimental group that means it maintained the same muscle power as that of day 1, but in control group mean value is reduced from 4.6 to 4 in right lower leg and 4.6 to 3.9 in left lower leg.

The critical analysis of the above data represents that 90% of subjects with Normal muscle power in experimental group on 7th day whereas in control group only 2.5% of subjects have normal muscle power. Thereby understood that experimental group had very good improvement and in control group had muscle power depletion due to immobility and reflecting that Nursing Intervention package is very effective to improve muscle strength.

5.2.4 (C) Effectiveness of Nursing Intervention Package on Limb circumference of critically ill patient

5.2.5 (C-1) Effectiveness of Nursing Intervention Package on Mid arm circumference of critically ill patient

In order to identify the Mid- Arm circumferences, the investigator divided the total sample based on normal and abnormal mid- arm circumferences. The normal Mid- Arm circumference of the adult human being is >**23 cm** in males, >22 cm in females. Based on the normal value the samples were classified in to two – Normal and Abnormal.

5.2.4 (C-1) Distribution of Mid arm circumference between group on day 1, 3 & 7

N=80+ 80

		Day 1				Day 3				Day 7			
		Mid- arm Circumference				Mid- arm Circumference				Mid-arm Circumference			
	Mid- arm Circumference	EG		CG		EG		CG		EG		CG	
		No	%	No	%	No	%	No	%	No	%	No	%
Rt	Normal Circumference	66	82.5	58	72.5	65	81.3	56	70.0	65	81.3	50	62.5
	Abnormal Circumference	14	17.5	22	27.5	15	18.8	24	30.0	15	18.8	30	37.5
Lt	Normal Circumference	65	81.3	59	73.8	65	81.3	57	71.3	65	81.3	53	66.3
	Abnormal Circumference	15	18.8	21	26.3	15	18.8	23	28.8	15	18.8	27	33.8

Table No. 5.2.4 (C-1) shows that the investigator classified both experimental and control group in to normal mid-arm circumference and abnormal mid-arm circumference based on the universal criteria as more than or equal to 23cm.

Table No. 5.2.4 (C-2) Comparison of overall mean of mid arm circumference between group on day 1, 3 & 7

N=80+ 80

Day 1						**Day 3**				**Day 7**			
Mid- Arm Circumference						Mid- Arm Circumference				Mid- Arm Circumference			
GP	No	M	SD	t	p	M	SD	t	p	M	SD	t	p
EG	80	27.5	8.6	0.38	0.708	27.4	8.7	1.06	0.290	27.8	8.8	2.84**	0.005
CG	80	27.1.	7.0			26.1	6.9			24.2	6.7		
EG	80	27.1	8.4	0.01	0.991	27.1	8.5	0.77	0.440	27.4	8.7	2.68**	0.008
CG	80	27.1	6.8			26.1	6.6			24.2	6.6		

**: - Significant at 0.01 level

Table No. 5.2.4 (C-2) shows the p value is not significant in the day 1 and reflects that the groups are homogenous and suitable for research study. While comparing the group on 3rd day mean score of experimental group have only 0.10 reduction whereas control group have 01 reduction. That means right mid arm circumference of experimental group is nine times better than control group. While evaluating the left mid arm circumferences experimental group is maintaining the same mid arm circumferences that of first day but the control group had score 01 reduction. That means the experimental group is ten times better than the control group. Both group comparison on third day shows slight variation but it was not much significant.

There is statistically significant difference between experimental and control group on 7th day comparison and this shows the intervention was very much effective in prevention of muscle atrophy in mid arm circumference.

5.2.4**(d) Effectiveness of Nursing Intervention Package on Mid-thigh circumference of critically ill patient**

The effectiveness of nursing Intervention package on mid-thigh was assessed by means of ANCOVA because there is no cut of value as normal reference value.

5.2.4(d) Comparison of mean value of mid-thigh circumference between group on day 1, 3 & 7 (ANCOVA)

N=80+ 80

Day 1						**Adjusted Day 3**						**Adjusted Day 7**					
Mid- thigh Circumference						Mid- thigh Circumference						Mid-thigh Circumference					
GP	No	M	SD	F	p	GP	No	M	SD	F	p	GP	No	M	SD	F	p
Right						Right						Right					
EG	80	44.4	15.4			EG	80	45.1	0.1	83.05**	0.000	EG	80	45.4	0.1		
																305.75**	
CG	80	45.9	11.4	0.48	0.491	CG	80	44.2	0.1			CG	80	41.9	0.1		0.000
Left						Left						Left					
EG	80	43.8	15.3			EG	80	44.8	0.1	91.9**	0.000	EG	80	45.1	0.2	272.75**	
CG	80	45.7	11.5	0.9	0.370	CG	80	43.9	0.1			CG	80	41.5	0.2		0.000

**:- Significant at 0.01 levels

The 5.2.4(d) table shows that due to lack of homogeneity among the group on first day and inorder to equalize the group for doing ANCOVA the investigator found out the adjusted day 3 value for both right and left Mid-thigh circumference.

While analysing the above data critically, mean value of experimental group is low while comparing with the control group. But on the third day right mid-thigh mean value in

experimental group is same but in control group it was reduced from 45.9 to 45 that means there is 0.9 mean score reduction in control group and shows the effectiveness of intervention. In the left mid-thigh vale experimental group maintained same mean score value in day 3 but in control group it was reduced from 45.7 to 44.9 that means there is reduction of 0.8 mean score value. These above changes reflects the effectiveness of intervention.

The comparison of group on day 7 denotes that the p value is not significant so the group is maintaining its homogeneity. While analysing the above data critically, mean value of experimental group is low while comparing with the control group. But on the 7^{th} day right mid-thigh mean value in experimental group is same but in control group it was reduced from 45.9 to 42.7 that means there is 3.2 mean score reduction in control group and shows the effectiveness of intervention.

In the left mid-thigh value experimental group maintained same mean score value in day 3 but in control group it was reduced from 45.7 to 42.5 that means there is reduction of 3.2 mean score value. These above changes mirror that the effectiveness of intervention.

5.2.4(e) Effectiveness of Nursing Intervention Package on Mid-calf circumference of critically ill patient

5.2.4(e) Distribution of Mid-calf circumference between group on day 1, 3 & 7

N=80+ 80

Day 1						Day 3				Day 7			
Mid- calf Circumference						Mid- calf Circumference				Mid- calf Circumference			
	Mid- calf Circumference	EG		CG		EG		CG		EG		CG	
		No	%	No	%	No	%	No	%	No	%	No	%
Rt	Normal Circumference	32	40.0	26	32.5	33	41.3	25	31.3	35	43.8	12	15.0
	Abnormal Circumference	48	60.0	54	67.5	47	58.8	55	68.8	45	56.3	68	85.0
Lt	Normal Circumference	30	37.5	24	30.0	28	35.0	22	27.5	32	40.0	12	15.0
	Abnormal Circumference	50	62.5	56	70.0	52	65.0	58	72.5	48	60.0	68	85.0

Table 5.2.4(e) shows that based on the normal value of mid-calf (above 31 cm) the following mid-calf value was divided into normal mid-calf circumference and abnormal mid-calf circumference.

5.2.4(f) Comparison of overall mean of mid-calf circumference between group on day 1, 3 & 7

N=80+ 80

Day 1						Day 3						Day 7					
Mid- calf Circumference						Mid- calf Circumference						Mid-calf Circumference					
GP	No	M	SD	t	p	GP	No	M	SD	t	p	GP	No	M	SD	t	p
Right						Right						Right					
EG	80	28.5	9.3	0.09	0.926	EG	80	28.4	9.4	0.71	0.479	EG	80	28.8	9.5	2.5*	0.013
CG	80	28.3	6.9			CG	80	27.5	6.9			CG	80	25.5	6.9		
Left						Left						Left					
EG	80	28.3	9.3	0.26	0.797	EG	80	28.3	9.3	0.9	0.370	EG	80	28.7	9.4	2.63**	0.009
CG	80	28.0	6.7			CG	80	27.2	6.8			CG	80	25.2	6.8		

**: - Significant at 0.01 level, *: - Significant at 0.05 level

5.2.4(e) Overall mean found to be significant with t value 2.5* ($p \leq 0.013$) at right mid-calf circumference and t value 2.63** ($p \leq 0.009$) displays that nursing intervention package was very much effective to prevent mid-calf muscle depletion due to immobility. The mean value of 3rd day also shows there is reduction of mid-calf circumference in the control group.

5.3.(a) Effect of nursing intervention package on outcome variables

Table 5.3 Distribution of duration of ICU stay & Hospital stay based on group

N= (80 + 80)

Duration of ICU stay	EG		CG		**Duration of hospital stay**	EG		CG	
	No	%	No.	%		No.	%	No.	%
3 - 4	53	66.3	44	55.0	**7 - 9**	70	87.5	37	46.3
5 - 6	25	31.3	24	30.0	**10 - 12**	10	12.5	29	36.3
>=7	2	2.5	12	15.0	**13 -14**	0	0.0	14	17.5

Table 5.3 displays that there is difference in number of days of ICU stay between experimental and control group. In the experimental group only two members were in ICU for more than 7 days but in control group 12 members were in ICU for more than 7 days.

The critical analysis of the data showed that 87.5% of experimental group subjects had discharge between 7-9 days whereas control group had only 46.3% of discharge within that period. Also 17.5% of control group subjects had discharge only after 13- 14 days. Since all baseline variables are similar to experimental and control group it is evident that the intervention was very much effective and have effect on outcome variable.

5.3.(b) Comparison of group based on overall mean of duration of ICU stay & Hospital Stay

N= (80 + 80)

Duration of ICU stay						**Duration of hospital stay**					
Group	No	Mean	SD	t	p	Group	No	Mean	SD	t	p
Exp. Gp	80	4.1	1.1	2.54*	0.012	**Exp.Gp**	80	8.3	1.1	6.96	p<0.01
Control Gp	80	4.8	1.9			**Control Gp**	80	10.3	2.4		

*: - Significant at 0.05 level

Table **5.3.(b)** denote that that there is statistically significant difference in duration of ICU stay and Hospital stay among experimental and control group. So it is evident that intervention have effect on outcome variable

5.3 Association of Limb circumference and muscle strength of critically ill patients with baseline Variables

Based on the objective 5, association of Limb circumference and muscle strength of critically ill patients with selected baseline variables was done.

5.3.2 Association of Upper muscle strength of critically ill patients with selected baseline Variables

In this section it was done that the Upper Muscle strength of the right and left together clubbed and divided into normal and abnormal and then done the association.

The data showed that there is no association between Upper muscle strength and age, Gender, BMI, and Diet adequacy whereas there is association between Upper Muscle strength with Sepsis and DM at $p<0.05$ level. That indicates the people those who had sepsis and DM had upper muscle strength abnormality.

The data showed that there is significant association between upper muscle strength and selected risk factors like Acidosis, Metabolic or Electrolyte abnormality, Sepsis, Sedatives and Analgesics Medication. That means the sample that have these risk factors had reduction in Muscle strength. So accepting the alternate hypothesis.

But there is negative association with smoking. So, accepting the null hypothesis.

Based on the reference value Bio-Chemical Parameters was divided into normal and abnormal and then did the association. The data showed that Haemoglobin is associated with Upper Muscle strength.

5.3.3 Association of Lower muscle strength of critically ill patients with selected baseline Variables

There is no association between lower muscle strength with age, Gender, BMI, and diet adequacy. There is association between Diabetes Mellitus, Acidosis, Metabolic/ Electrolyte abnormalities, fever, sedatives, Analgesics medications, Hypertension, smoking, and selected Bio- Chemical parameters like Creatinine and Haemoglobin.

5.3.4 Association of mid arm circumference of critically ill patients with selected baseline Variables

The mid arm circumference was divided in to normal and abnormal based on normal value of mid arm circumference. The test shows that there is association between mid-arm circumference and Gender, co-morbid conditions, there is negative association between acidosis, smoking, and biochemical markers like Sodium

Association of Mid-thigh circumference of critically ill patients with selected baseline Variables

In order to do the association of mid- thigh took the average of the mid-thigh circumferences and then did t test.

The t test shows there is no association between mid-thigh circumferences and baseline variables, co-morbid conditions and there is negative association between some of the risk factors like Acidosis, Sedatives, and Analgesic medications.

The test shows there is significant association between mid-thigh circumferences and selected Bio-chemical makers like Sodium and Calcium.

5.3.5 Association of mid-calf circumference of critically ill patients with selected baseline Variables

There is no association between mid-calf circumferences and selected baseline variables, co morbid conditions and Bio-chemical markers.

There is significant association between fever and mid- calf circumferences but there is negative association between Anti-cholinergic medications and mid-calf circumferences.

6. SUMMARY AND OUTCOME OF THE STUDY

Subjects admitted in Critical care area will have muscle atrophy due to immobility. Exercise will prevent from muscle atrophy.

Review of literature was taken and is related to:-

The conceptual frame work opted for this study based on the Betty Neumann's system model. Experimental design was selected with 80 samples in experimental group and 80 samples in control group. The selection of the subjects was by simple random technique and the study was conducted in a tertiary care hospital at Pathanamthitta district.

The extensive review of literature, internet search, expert discussion in the field of Medical Surgical Nursing, physicians, physiotherapists, dieticians, statisticians in order to select most appropriate and suitable assessment tools for the data collection.

The pilot study was conducted after acquiring the special training from the physiotherapy department and concluded that, the exercise will have real effect on muscle power and muscle circumference and thereby reduction of skeletal muscle atrophy.

The main study started with obtaining prior permission from the hospital as well as from the critical care department.

The blinding of the study was done by the investigator as follows-

- The investigator assigned the critical care shift in-charge to assign the subjects in experimental and control group. The shift in charges assigned the everyday new cases by tossing the coin method to experimental and control group after identifying the inclusion and exclusion criteria.
- The investigator assigned three staff of each shift to take the measurements after giving the training.
- Investigator herself given the nursing intervention package to the subjects with the identification of subject by the shift in charge.
- Positioning was done by the nurses as per the instruction of the shift in charge.
- After taking the measurement the specially trained nurses were given the collected data to the shift in-charges. They marked in the sheet as Experimental group and control group.
- After collecting the pre and post (3^{rd} and 7^{th}) test the assessment sheet was handed over to the investigator by the shift in-charges.
- The members helped for the study maintained confidentiality throughout the pilot study and main study.
- The entire data was completed from all research participants within the stipulated period.
- The outcome finding of the study was effective in experimental group. The outcome findings were length of ICU stay and length of hospital stay. Length of hospital stay in experimental group was 87.5% within 7-9 days whereas in control group it was only 46.3% within 7-9 days and also 17.5% had discharged after 13-14 days too.
- The length of ICU stay of the experimental group in which only two members with more than 7 days of ICU stay but in control group it was 12 members.

IMPLICATION

Nursing Practice:

- Nurses are the professionals always with the patient especially in critical care area. While caring the patient, if we think beyond the routine activities means, that will heighten profession as well as improving the condition of the patient. If a critical area nurse focus on unattended muscle care means there will be fast recovery of the patient and while discharging the patient from critical care the general health as well as general appearance of the patient will be improved.
- Positioning, Range of Motion exercises, PNF exercises and message therapy are nursing interventions. Nurses are there for nursing, supporting and caring for patients in every way possible. If the nurses are taking up their responsibilities in all aspects, that itself will speedy recovery of patients.
- Nurses should create awareness and motivate others in their family to use these approaches whenever any family member is immobilized for long time. Teach all staff nurses about the result of the nursing intervention package and motivate them to do for their patients whenever they take care.
- Nurses can give health education to the patients as well as to the care givers about the nursing intervention package and can reduce muscle atrophy due to immobility.
- Positioning will enhance the blood supply to the area and helps to prevent decubitus ulcers too. While increasing the blood supply and reducing stagnant blood supply to each and every cell, helps to improve the cellular function and maintaining the healthy cells thereby reducing the atrophy of the muscles.
- Massage positively affects patients and strengthens the relationship between patient and nurse. It provides a sense of pleasure of human touch. Massage offers a direct contrast to a routine nursing interventions. It helps the patients in bringing to a relaxed state. Administering a back massage can positively influence a patient's psychological state, eliciting a sense of emotional well-being. Massage affects both body and mind.
- Nurse's ability to provide high touch as well as high tech care and to support the healing of the entire patient will help define nursing in the century. The effectiveness of massage as an independent nursing intervention and the time evolved in its delivery is an essential step in successful integration of massage into routine nursing care.

Nursing Education:

- The nursing curriculum has to emphasize more on non- pharmacological methods to improve the general health of the patients as well as to reduce complications and prevent diseases.
- Nurses are expected to play an essential role in health promotion through the delivering of health education to patients and to the general public. It includes self-management skills, medications, risk factors, exercise, stress and diet. Continuing education provides evidence- based care in the fast- changing world of critical care nursing. Other non-pharmacological method, non-invasive therapies are available for speedy recovery of critical care patients, including exercise, acupuncture, and massage and mind body intervention.
- Nursing students needs to understand the importance of non-pharmacological nursing interventions and integrate it while rendering comprehensive care for patient which thereby improves the quality of life and functional abilities.
- Nurse educator's needs to recognise non-pharmacological nursing interventions as an integral component of patient care and collaborate with multidisciplinary team members in educating patients on evidence based treatments which can improve their health and prevent further diseases.
- Presentations and journal clubs on non-pharmacological nursing interventions can be organized so that the general conditions of immobilized patients can improve in the hospital as well as home setup.

Nursing Administration:

- A hospital policy should be adopted to provide non-pharmacological nursing interventions or written information to all in patients and out patients.
- It is the duty and responsibility of the nurse administrator to take initiative in organizing continuing educational programs in massage therapy for nursing personnel in hospital and community settings to gain knowledge about the non -pharmacological nursing interventions.
- Nurse administrator should take initiative about implementing non-pharmacological nursing interventions in the critical care area and its importance in patient life.

Nursing Research:

- Nurses have the opportunity to identify gaps in health care, explore this unknown territory, and generate new knowledge.

- There is need for Trans- disciplinary teams that engage in EBP, quality improvement and research.
- The Trans -disciplinary team include but is not limited to partners from medicine, public health and nursing, with additional collaborations with colleagues from a range of disciplines such as pharmacy, nutrition, economics and psychology, insurance and the community. Nurses are uniquely qualified to engage and lead scientific inquiry targeted to improve outcomes among patients of critical illness.

LIMITATIONS

- Different disease conditions are included in each group so cannot identify which disease condition and muscle atrophy are more related.
- Setting of the study was in ICU so there was limitation in out of bed movement.
- Study was limited to a single setting of the entire hospital.

RECOMMENDATIONS

- On the basis of the findings and limitations of the study, the recommendations for further studies are as follows.
- Study can be replicated in different setting even within the same hospital
- More number of participants can be included in the study which helps in generalization of the findings.
- Studies can be conducted in comparison with nutritional package and exercise package for muscle atrophy.
- Studies can be conducted in comparison with ventilated and non-ventilated patients for muscle atrophy.
- Studies can be conducted in comparison with the disease conditions and muscle atrophy.

7. CONCLUSION

The study was concluded that nursing interventional package was very effective to prevent skeletal muscle atrophy among critical care patients. The analysis showed that there is significant difference in muscle atrophy between the experimental and control group. So the nursing intervention package is effective for the critically ill patients while admitted in the critical area.

REFERENCES

1. Polit Denise, F and Beck Cheryl Tatano (2017) "Nursing research; Generating and Assessing Evidence for Nursing Practice" 10th edition, Wolters Kluwer Publisher, New Delhi.

2. Lee H, Ko YJ, Suh GY, Yang JH, Park CM, Jeon K, et al. Safety profile and feasibility of early physical therapy and mobility for critically ill patients in the medical intensive care unit: Beginning experiences in Korea. J Crit Care. 2015;30(4): 673-7. https://doi.org/10.1016/j. jcrc.2015.04.012

3. Gray Jennifer R. Grove Susan K. Sutherland Suzanne. "Burns and Grove's Tha Practice of Nursing Research Appraisal, synthesis and Generation of Evidence" 8th Edition. Elsevier publishers, Texas.

4. Parry SM, Puthucheary ZA. The impact of extended bed rest on the musculoskeletal system in the critical care environment. Extrem Physiol Med. 2015;4:16. https://doi.org/10.1186/s13728-015-0036-7

5. Mehrholz J, Pohl M, Kugler J, Burridge J, Mückel S, Elsner B. Physical rehabilitation for critical illness myopathy and neuropathy: an abridged version of Cochrane Systematic Review. Eur J Phys Rehabil Med. 2015;51(5):655-61. https://doi.org/10.1002/14651858. cd010942.pub2

6. Shpata V, Ohri I, Nurka T, Prendushi X. The prevalence and consequences of malnutrition risk in elderly Albanian intensive care unit patients. Clin Interv Aging. 2015; 10:481-6. https://doi. org/10.2147/CIA.S77042

7. Sterniczuk R, Rusak B, Rockwood K. Sleep disturbance in older ICU patients. Clin Interv Aging. 2014; 9:969-77. https://doi.org/10.2147/ CIA.S59927

8. Puthucheary ZA, Hart N. Skeletal muscle mass and mortality - but what about functional outcome? Crit Care. 2014; 18(1):110. https:// doi.org/10.1186/cc13729

9. *(Nielsen DH, Wardsworth CT, Krishnan R, Sear m. Inter-rater reliability of Manual Muscle Test and Hand-held Dynametric Muscle testing. Journal of Physical Therapy. 1987;67:1342-47)*